MARINE ELECTRICAL RESISTIVITY IMAGING OF SHALLOW-WATER WETLANDS

Mansoor, Nasser and **Slater,** Lee
Department of Earth & Environmental Sciences, Rutgers University, Newark, NJ

Continuous marine electrical resistivity imaging (ERI) using floating electrodes was conducted from a paddleboat to predict spatial and temporal patterns of pore-fluid conductivity within Kearny freshwater marsh soil. Resistivity measurements were obtained with marine-acquisition software and a multi-channel resistivity instrument at 6 times over a four month period, covering a 10,000 m^2 grid. A set of 10 simultaneous reception channel measurements were continuously recorded every two seconds yielding an average of 13,000 measurements per survey. Three dimensional inversion was carried out to determine the conductivity distribution of the subsurface using the smoothness-constrained least-squares optimization method. The continuously recorded surface water conductivity and average depth were entered as known information in the three dimensional (3-D) inversion and measurement error (for constraining the inversion) estimated from tie points. Pore-fluid conductivity was constrained using surface conduction measurements obtained from laboratory experiments on soils extracted from the wetland and a correction for temporal and spatial temperature variations using direct surface water temperature measurements.

The study demonstrates that: (1) continuous ERI is an ideal method for determining the resistivity structure of wetland sediments covered by a shallow surface water layer such as those in the New Jersey Meadowlands, (2) temperature variations must be considered in such shallow monitoring studies as they may otherwise have the most significant influence on the results, and (3) surface conduction is significant in marsh soils and must be accounted for if subsurface conductivity models are to be reliably interpreted in terms of pore-fluid chemistry. In this study, changes in pore-water conductivity estimated from inverted models suggest that migration of contamination from marginal landfills into the Kearny marsh accompanies rainfall events.